Atmos. Chem. Phys. Discuss., 2, S22–S24, 2002
www.atmos-chem-phys.org/acpd/2/S22/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "NAT-rock formation by mother clouds: a microphysical model study" *by* S. Fueglistaler et al.

**Anonymous Referee #1**

Received and published: 4 March 2002

It has been long recognized that removal of large amounts of nitric acid from the polar winter stratosphere by particle sedimentation requires 'selective' nucleation of particles. If all particles in the stratosphere (1-10 cm-3) nucleate to NAT (or other low vapor pressure phase), than each would grow to only 1 or 2 um in diameter - insufficiently large to attain significant fall velocity.

Fueglistaler et al. present a model that illustrates that the selective nucleation can be geographic - in particular nucleation aloft - and need not be selective in the sense that only a few of the many freeze. The show using a very idealized model how this mechanism can produce large (10-20 um) particles in the lower stratosphere consistent with the recent observations obtained during SOLVE from the NASA ER-2 aircraft.

This paper should be of considerable interest to the ACPD readers.



Full Screen / Esc
Print Version
Interactive Discussion
Original Paper

Specific comments.

1. the authors seem to say "QED". I think with only the evidence produced in this paper some of the strong conclusions (which may well be reached with a full analysis of the THESEO/SOLVE data set) should be toned down. This is really no more than a hypothesis at this point and should be treated as such.

Specific comments:

Pg. 30 ln 17: reference to recent paper by Gao et al. should be given. Pg 31 ln 8-10. It is not shown here that this mechanism explains the "observed characteristics" of the large particles. Perhaps some characteristics (size, number density). Location and time where they are found and not found is not explained here.

The discussion of the "flux reduction layer" I find confusing. Isn't it really just a continuum? As time goes on and more nitrogen is carried downward the particles have to fall through air with less gas phase HNO3. What makes the FRL special? Does our (PSC) field really need more jargon?

Pg 32 ln 23- pg 33 ln 10. Please show the gas phase HNO3 and temperature profiles that correspond to the conditions described (SNAT = 10); HNO3 total = 8 ppbv.

Pg 33 ln 17. Units of ppb x km /day are somewhat strange given that the volume mixing ratio of HNO3 on a particle falling but not changing size will decrease. Perhaps a better unit?

Pg 34 ln 11. There is no such thing as the "STS existence temperature". STS is the H2SO4/H2O/HNO3 (liquid) <-> H2O(g) , HNO3(g) system. It is perfectly well defined for all conditions described here.

Pg 35 ln 12 no -> not. A reference to the Dhaniyala et al. paper with respect to sheer would be warranted here.

Pg 35 ln 18 "reveal" is too strong a word for what is actually shown here. Consistent



**ACPD**

2, S22–S24, 2002

would be fine.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 29, 2002.